



DEPARTMENT OF THE AIR FORCE  
59TH MEDICAL WING (AETC)  
JOINT BASE SAN ANTONIO - LACKLAND TEXAS



11 MAY 2017

MEMORANDUM FOR SGVT

ATTN: MAJ CHARLES BORDERS

FROM: 59 MDW/SGVU

SUBJECT: Professional Presentation Approval

1. Your paper, entitled **An Incidental Finding of Eisenmenger Syndrome in an Adult Following a Motor Vehicle Accident** presented at/published to **ATS 2017, Washington DC, 19-24 May 2017** in accordance with MDWI 41-108, has been approved and assigned local file #**17231**.
2. Pertinent biographic information (name of author(s) title, etc.) has been entered into our computer file. Please advise us (by phone or mail) that your presentation was given. At that time, we will need the date (month, day and year) along with the location of your presentation. It is important to update this information so that we can provide quality support for you, your department, and the Medical Center commander. This information is used to document the scholarly activities of our professional staff and students, which is an essential component of Wilford Hall Ambulatory Surgical Center (WHASC) internship and residency programs.
3. Please know that if you are a Graduate Health Sciences Education student and your department has told you they cannot fund your publication, the 59th Clinical Research Division may pay for your basic journal publishing charges (to include costs for tables and black and white photos). We cannot pay for reprints. If you are a 59 MDW staff member, we can forward your request for funds to the designated Wing POC at the Chief Scientist's Office, Ms. Alice Houy, office phone: 210-292-8029; email address: [alice.houy.civ@mail.mil](mailto:alice.houy.civ@mail.mil).
4. Congratulations, and thank you for your efforts and time. Your contributions are vital to the medical mission. We look forward to assisting you in your future publication/presentation efforts.

LINDA STEEL-GOODWIN, Col, USAF, BSC  
Director, Clinical Investigations & Research Support



# PROCESSING OF PROFESSIONAL MEDICAL RESEARCH/TECHNICAL PUBLICATIONS/PRESENTATIONS

## INSTRUCTIONS

USE ONLY THE MOST CURRENT 59 MDW FORM 3039 LOCATED ON AF E-PUBLISHING

1. The author must complete page two of this form:
  - a. In Section 2, add the funding source for your study [e.g., 59 MDW CRD Graduate Health Sciences Education (GHSE) (8G5 O&M); 8G5 R&D; Tri-Service Nursing Research Program (TSNRP); Defense Medical Research & Development Program (DMRDP); NIH; Congressionally Directed Medical Research Program (CDMRP); Grants; etc.]
  - b. In Section 2, there may be funding available for journal costs, if your department is not paying for figures, tables or photographs for your publication. Please state "YES" or "NO" in Section 2 of the form, if you need publication funding support.
2. Print your name, rank/grade, sign and date the form in the author's signature block or use an electronic signature.
3. Attach a copy of the 59 MDW IRB or IAC/UC approval letter for the research related study. If this is a technical publication/presentation, state the type (e.g. case report, QA/QI study, program evaluation study, informational report/briefing, etc.) in the "Protocol Title" box.
4. Attach a copy of your abstract, paper, poster and other supporting documentation.
5. Save and forward, via email, the processing form and all supporting documentation to your unit commander, program director or immediate supervisor for review/approval.
6. On page 2, have either your unit commander, program director or immediate supervisor:
  - a. Print their name, rank/grade, title; sign and date the form in the approving authority's signature block or use an electronic signature.
7. Submit your completed form and all supporting documentation to the CRD for processing (59crdpubspres@us.af.mil). This should be accomplished no later than 30 days before final clearance is required to publish/present your materials. If you have any questions or concerns, please contact the 59 CRD/Publications and Presentations Section at 292-7141 for assistance.
8. The 59 CRD/Publications and Presentations Section will route the request form to clinical investigations, 502 ISG/JAC (Ethics Review) and Public Affairs (59 MDW/PA) for review and then forward you a final letter of approval or disapproval.
9. Once your manuscript, poster or presentation has been approved for a one-time public release, you may proceed with your publication or presentation submission activities, as stated on this form. Note: For each new release of medical research or technical information as a publication/presentation, a new 59 MDW Form 3039 must be submitted for review and approval.
10. If your manuscript is accepted for scientific publication, please contact the 59 CRD/Publications and Presentations Section at 292-7141. This information is reported to the 59 MDW/CC. All medical research or technical information publications/presentations must be reported to the Defense Technical Information Center (DTIC). See 59 MDWI 41-108, *Presentation and Publication of Medical and Technical Papers*, for additional information.
11. The Joint Ethics Regulation (JER) DoD 5500.07-R, *Standards of Conduct*, provides standards of ethical conduct for all DoD personnel and their interactions with other non-DoD entities, organizations, societies, conferences, etc. Part of the Form 3039 review and approval process includes a legal ethics review to address any potential conflicts related to DoD personnel participating in non-DoD sponsored conferences, professional meetings, publication/presentation disclosures to domestic and foreign audiences, DoD personnel accepting non-DoD contributions, awards, honoraria, gifts, etc. The specific circumstances for your presentation will determine whether a legal review is necessary. If you (as the author) or your supervisor check "NO" in block 17 of the Form 3039, your research or technical documents will not be forwarded to the 502 ISG/JAC legal office for an ethics review. To assist you in making this decision about whether to request a legal review, the following examples are provided as a guideline:

For presentations before professional societies and like organizations, the 59 MDW Public Affairs Office (PAO) will provide the needed review to ensure proper disclaimers are included and the subject matter of the presentation does not create any cause for DoD concern.

If the sponsor of a conference or meeting is a DoD entity, an ethics review of your presentation is not required, since the DoD entity is responsible to obtain all approvals for the event.

If the sponsor of a conference or meeting is a non-DoD commercial entity or an entity seeking to do business with the government, then your presentation should have an ethics review.

If your travel is being paid for (in whole or in part) by a non-Federal entity (someone other than the government), a legal ethics review is needed. These requests for legal review should come through the 59 MDW Gifts and Grants Office to 502 ISG/JAC.

If you are receiving an honorarium or payment for speaking, a legal ethics review is required.

If you (as the author) or your supervisor check "YES" in block 17 of the Form 3039, your research or technical documents will be forwarded simultaneously to the 502 ISG/JAC legal office and PAO for review to help reduce turn-around time. If you have any questions regarding legal reviews, please contact the legal office at (210) 671-5795/3365, D8N 473.

NOTE: All abstracts, papers, posters, etc., should contain the following disclaimer statement:

*"The views expressed are those of the [author(s)] [presenter(s)] and do not reflect the official views or policy of the Department of Defense or its Components"*

NOTE: All abstracts, papers, posters, etc., should contain the following disclaimer statement for research involving humans:

*"The voluntary, fully informed consent of the subjects used in this research was obtained as required by 32 CFR 219 and DODI 3216.02\_AFI 40-402."*

NOTE: All abstracts, papers, posters, etc., should contain the following disclaimer statement for research involving animals, as required by AFMAN

40-401\_IP:

*"The experiments reported herein were conducted according to the principles set forth in the National Institute of Health Publication No. 80-23, Guide for the Care and Use of Laboratory Animals and the Animal Welfare Act of 1966, as amended."*



# PROCESSING OF PROFESSIONAL MEDICAL RESEARCH/TECHNICAL PUBLICATIONS/PRESENTATIONS

1. TO: CLINICAL RESEARCH		2. FROM: (Author's Name, Rank, Grade, Office Symbol) Maj Charles Borders; 959 MDG, MCHE-ZDM-P		3. GME/GHSE STUDENT: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		4. PROTOCOL NUMBER: NA	
5. PROTOCOL TITLE: (NOTE: For each new release of medical research or technical information as a publication/presentation, a new 59 MDW Form 3039 must be submitted for review and approval.) An Incidental Finding of Eisenmenger Syndrome in an Adult Following a Motor Vehicle Accident							
6. TITLE OF MATERIAL TO BE PUBLISHED OR PRESENTED: An Incidental Finding of Eisenmenger Syndrome in an Adult Following a Motor Vehicle Accident							
7. FUNDING RECEIVED FOR THIS STUDY? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO FUNDING SOURCE:							
8. DO YOU NEED FUNDING SUPPORT FOR PUBLICATION PURPOSES: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO							
9. IS THIS MATERIAL CLASSIFIED? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO							
10. IS THIS MATERIAL SUBJECT TO ANY LEGAL RESTRICTIONS FOR PUBLICATION OR PRESENTATION THROUGH A COLLABORATIVE RESEARCH AND DEVELOPMENT AGREEMENT (CRADA), MATERIAL TRANSFER AGREEMENT (MTA), INTELLECTUAL PROPERTY RIGHTS AGREEMENT ETC.? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO NOTE: If the answer is YES then attach a copy of the Agreement to the Publications/Presentations Request Form.							
11. MATERIAL IS FOR: <input checked="" type="checkbox"/> DOMESTIC RELEASE <input type="checkbox"/> FOREIGN RELEASE CHECK APPROPRIATE BOX OR BOXES FOR APPROVAL WITH THIS REQUEST. ATTACH COPY OF MATERIAL TO BE PUBLISHED/PRESENTED.							
<input type="checkbox"/> 11a. PUBLICATION/JOURNAL (List intended publication/journal.)							
<input type="checkbox"/> 11b. PUBLISHED ABSTRACT (List intended journal.)							
<input checked="" type="checkbox"/> 11c. POSTER (To be demonstrated at meeting: name of meeting, city, state, and date of meeting.) ATS 2017; Washington, DC; May 19-24, 2017							
<input type="checkbox"/> 11d. PLATFORM PRESENTATION (At civilian institutions: name of meeting, state, and date of meeting.)							
<input type="checkbox"/> 11e. OTHER (Describe: name of meeting, city, state, and date of meeting.)							
12. HAVE YOUR ATTACHED RESEARCH/TECHNICAL MATERIALS BEEN PREVIOUSLY APPROVED TO BE PUBLISHED/PRESENTED? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO ASSIGNED FILE # _____ DATE _____							
13. EXPECTED DATE WHEN YOU WILL NEED THE CRD TO SUBMIT YOUR CLEARED PRESENTATION/PUBLICATION TO DTIC NOTE: All publications/presentations are required to be placed in the Defense Technical Information Center (DTIC).							
DATE May 01, 2017							
14. 59 MDW PRIMARY POINT OF CONTACT (Last Name, First Name, M.I., email) Borders, Charles W; charles.w.borders10.mil@mail.mil						15. DUTY PHONE/PAGER NUMBER 210-513-0164	
16. AUTHORSHIP AND CO-AUTHOR(S) List in the order they will appear in the manuscript							
LAST NAME, FIRST NAME AND M.I.		GRADE/RANK		SQUADRON/GROUP/OFFICE SYMBOL		INSTITUTION (If not 59 MDW)	
a. Primary/Corresponding Author Charles W Borders		O-4		MCHE-ZDM-P			
b. Justin Reis		O-4		MCHE-ZDM-P			
c. Andrea N Dore		O-3		MCHE-ZDM-Z			
d.							
e.							
17. IS A 502 ISG/JAC ETHICS REVIEW REQUIRED (JER DOD 5500.07-R)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO							
I CERTIFY ANY HUMAN OR ANIMAL RESEARCH RELATED STUDIES WERE APPROVED AND PERFORMED IN STRICT ACCORDANCE WITH 32 CFR 219, AFMAN 40-401 JP, AND 59 MDWI 41-108. I HAVE READ THE FINAL VERSION OF THE ATTACHED MATERIAL AND CERTIFY THAT IT IS AN ACCURATE MANUSCRIPT FOR PUBLICATION AND/OR PRESENTATION.							
18. AUTHOR'S PRINTED NAME, RANK, GRADE Maj Charles W Borders III				19. AUTHOR'S SIGNATURE BORDERS CHARLES W III 130473003 _____		20. DATE	
21. APPROVING AUTHORITY'S PRINTED NAME, RANK, TITLE Edward T. McCann, Maj, USAF, MC				22. APPROVING AUTHORITY'S SIGNATURE MCCANN EDWARD T 1244102845 _____		23. DATE April 27, 2017	



# PROCESSING OF PROFESSIONAL MEDICAL RESEARCH/TECHNICAL PUBLICATIONS/PRESENTATIONS

## 1st ENDORSEMENT (59 MDW/SGVU Use Only)

TO: Clinical Research Division 59 MDW/CRD Contact 292-7141 for email instructions.	24. DATE RECEIVED 9 May 2017	25. ASSIGNED PROCESSING REQUEST FILE NUMBER 17231
--	---------------------------------	--

26. DATE REVIEWED 10 May 2017	27. DATE FORWARDED TO 502 ISG/JAC
----------------------------------	-----------------------------------

28. AUTHOR CONTACTED FOR RECOMMENDED OR NECESSARY CHANGES: ☒ NO ☐ YES If yes, give date. ☐ N/A

29. COMMENTS ☒ APPROVED ☐ DISAPPROVED

The poster presentation and abstract are approved. Prior to final approval, the DoD disclaimer statement on the poster presentation needs to be copied and applied to the abstract. The abstract is missing the DoD disclaimer statement. Once this has been administratively corrected, please notify the author of the correction to the abstract.

30. PRINTED NAME, RANK/GRADE, TITLE OF REVIEWER Rocky Calcote, PhD, Clinical Research Administrator	31. REVIEWER SIGNATURE CALCOTE, ROCKY D. 1175245544	32. DATE
--	--	----------

## 2nd ENDORSEMENT (502 ISG/JAC Use Only)

33. DATE RECEIVED	34. DATE FORWARDED TO 59 MDW/PA
-------------------	---------------------------------

35. COMMENTS ☐ APPROVED (In compliance with security and policy review directives.) ☐ DISAPPROVED

36. PRINTED NAME, RANK/GRADE, TITLE OF REVIEWER	37. REVIEWER SIGNATURE	38. DATE
---	------------------------	----------

## 3rd ENDORSEMENT (59 MDW/PA Use Only)

39. DATE RECEIVED May 11, 2017	40. DATE FORWARDED TO 59 MDW/SGVU May 11, 2017
-----------------------------------	---

41. COMMENTS ☒ APPROVED (In compliance with security and policy review directives.) ☐ DISAPPROVED

42. PRINTED NAME, RANK/GRADE, TITLE OF REVIEWER Kevin Jimma, SSgt/E-5, 59 MDW Public Affairs	43. REVIEWER SIGNATURE Digitally signed by KEVIN JIMMA, DN: cn=KEVIN JIMMA, o=59 MDW, ou=59 MDW, email=jimma.59mdw@us.af.mil, c=US	44. DATE May 11, 2017
---	---	--------------------------

## 4th ENDORSEMENT (59 MDW/SGVU Use Only)

45. DATE RECEIVED	46. SENIOR AUTHOR NOTIFIED BY PHONE OF APPROVAL OR DISAPPROVAL <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> COULD NOT BE REACHED <input type="checkbox"/> LEFT MESSAGE
-------------------	--

47. COMMENTS ☐ APPROVED ☐ DISAPPROVED

48. PRINTED NAME, RANK/GRADE, TITLE OF REVIEWER	49. REVIEWER SIGNATURE	50. DATE
---	------------------------	----------

## An Incidental Finding of Eisenmenger Syndrome in an Adult Following a Motor Vehicle Accident

Charles Borders, Maj, USAF MC

Justin Reis, Maj, USAF MC

Andrea N Dore, CPT, MC USA

San Antonio Military Medical Center

MCHE-MDP

3551 Roger Brooke Drive

Fort Sam Houston, TX, 78234

Classification: ?

Discipline: Adult

Subclassification: Case Report

Reviewing Assembly: ?

### Introduction:

Eisenmenger Syndrome, defined as pulmonary hypertension and cyanosis in individuals with any systemic-to-pulmonary communication, is rarely encountered in adult patients due to early identification and correction of congenital abnormalities. Uncorrected shunts typically progress to Eisenmenger physiology before puberty.

Patients presenting later may be asymptomatic prior to flow reversal. In the era of perinatal screening, it is rare to encounter an adult patient with an uncorrected defect.

### Case Presentation:

A 39 year-old male with history of substance abuse was found unconscious after being struck by a motor vehicle. He was intubated in the field for airway protection and brought to a community hospital prior to transfer our trauma center for further care.

The patient was initially normotensive without significant hypoxia . His initial trauma evaluation revealed a non-operative pelvic fracture and significant cardiomegaly. There were additional radiographic findings suggestive of significant pulmonary hypertension (PH), including a dilated pulmonary artery (4.6 cm) and diffuse mosaic attenuation. Examination was significant for digital clubbing, a palpable precordial heave, and a loud holosystolic murmur at the left upper sternal border.

Echocardiogram was significant for an estimated systolic pulmonary artery pressure of 114 mmHg and what appeared to be a 7mm aorto-ventricular fistula, with bidirectional flow on Doppler, consistent with Eisenmenger syndrome.

The patient was successfully extubated to high-flow humidified oxygen, but continued to demonstrate relative hypoxia consistent with his suspected underlying shunt. Subsequent gated cardiac computed tomography defined his cardiac anomaly as a perimembranous ventricular septal defect. At that time the primary surgical team empirically initiated sildenafil therapy for treatment of the PH. This was subsequently discontinued given the uncertainty surrounding the patient's underlying hemodynamics, which had not yet been determined by heart catheterization.

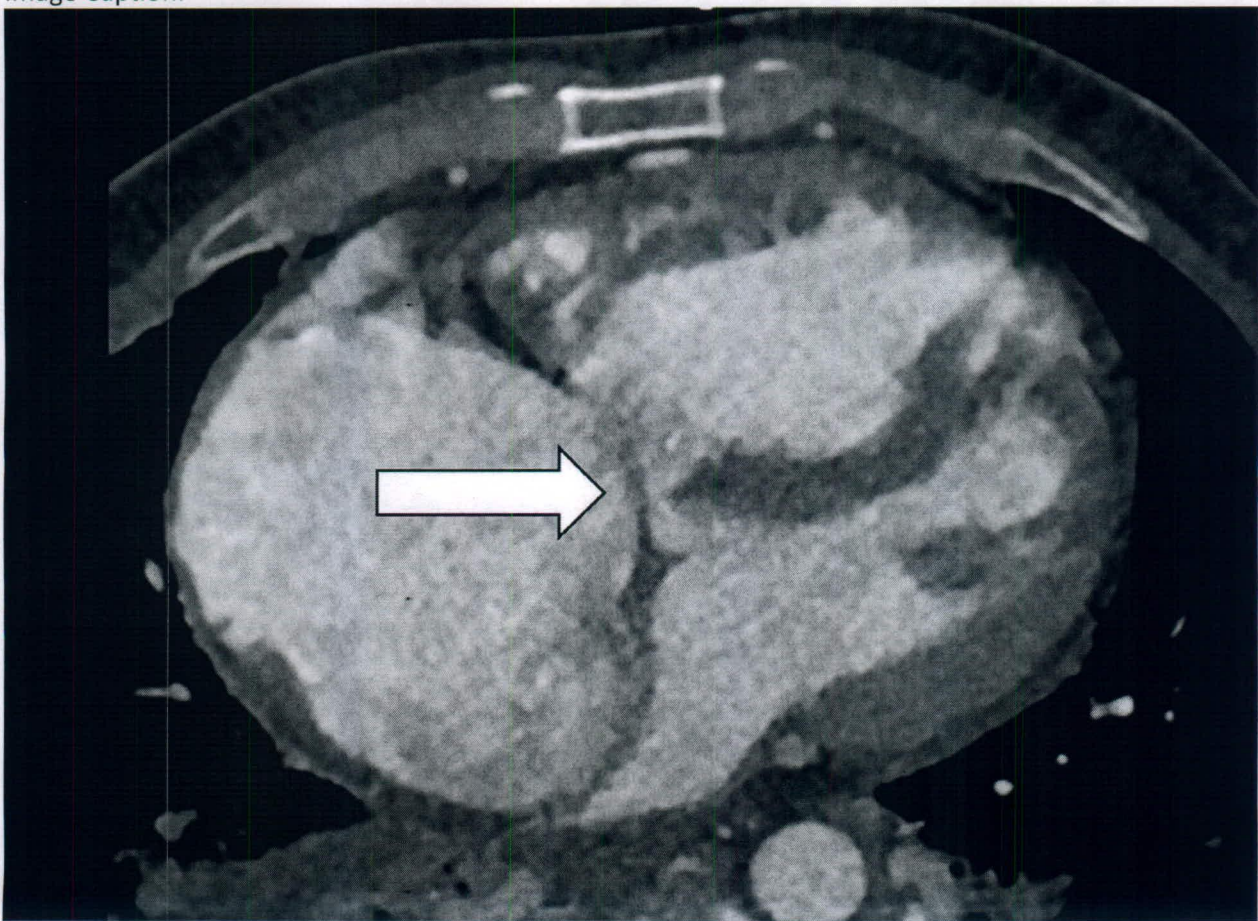


Given the difficulty in initiating therapy in this patient without knowledge of his underlying hemodynamics, the patient was transferred to a pulmonary hypertension Center of Excellence for further evaluation and treatment.

**Discussion:**

The hemodynamics of Eisenmenger's Syndrome are complex under the most controlled conditions. The management of such patients in trauma is unknown given the paucity of adult patients presenting with this diagnosis. In the case of our patient, although he had been told he had a heart condition as a child, access-to-care barriers had prevented a definitive diagnosis or pediatric intervention, leaving the worsening condition to be incidentally discovered in adulthood. Although early diagnosis and intervention is ideal, clinicians should be prepared for late presentations of this disorder.

**Image Caption:**



Cardiac CT clearly demonstrating uncorrected membranous ventricular septal defect. Note also the extreme dilation of the atria.

The view(s) expressed herein are those of the author(s) and do not reflect the official policy or position of San Antonio Military Medical Center, San Antonio Uniformed Services Health Consortium, the U.S. Army Medical Dept, the U.S. Army Office of the Surgeon General, the Dept of the Air Force or Army, Dept of Defense, or the U.S. Government.





# An Incidental Finding of Eisenmenger Syndrome in an Adult Following a Motor Vehicle Accident

Charles Borders, Maj, USAF MC<sup>1</sup>; Andrea N Dore, Capt, USAF MC<sup>2</sup>; Justin Reis, Maj, USAF MC<sup>1</sup>

<sup>1</sup>Pulmonary & Critical Care Department, San Antonio Military Medical Center, San Antonio (TX)

<sup>2</sup>Department of Internal Medicine, San Antonio Military Medical Center, San Antonio (TX)

Correspondence: justin.e.reis.mil@mail.mil



## Introduction

- Eisenmenger Syndrome (ES) is pulmonary hypertension and cyanosis in individuals with congenital heart defects with systemic-to-pulmonary communication.
- Uncorrected shunts typically progress to Eisenmenger physiology before puberty.
- Patients presenting later may be asymptomatic prior to flow reversal.
- ES is rarely encountered in adult patients due to early identification and correction of congenital abnormalities during perinatal screening.

## Case Presentation

- 39 year-old male with history of substance abuse found unconscious after being struck by a motor vehicle, initially intubated for airway protection, admitted to our facility as a trauma patient.
- Noted orthopedic injuries: Small subdural hematomas bilaterally and a complex non-operative pelvic fracture.
- Initial trauma survey was significant for:
  - Cardiomegaly noted on CXR
  - Dilated right ventricle noted on computed tomography (CT) Aorta
- Cardiac examination was significant for:
  - Loud 1<sup>st</sup> heart sound
  - Wide split of 2<sup>nd</sup> heart sound
  - Holosystolic murmur at the left sternal border
  - S4 gallop
  - Right precordial heave throughout the anterior wall
  - Laterally displaced point of maximal impulse
- Initial cardiac CT suggested left-to-right shunt.
- Physical examination findings (clubbing, no peripheral edema) suggested chronic/compensated disease.
- Initial transthoracic echocardiogram noted perimembranous ventricular septal defect with right-sided chamber dilation and functional severe tricuspid regurgitation with pulmonary artery systolic pressure of 114 mmHg.
- Patient was extubated to high-flow nasal cannula on HD4
- Patient was initially empirically treated with oral sildenafil, but this was discontinued due to the lack of knowledge of the patient's underlying physiology.
- Right- and Left-heart catheterizations were considered but not performed given the patient's inability to receive ongoing care and follow-up within our system.
- Patient was transferred to a pulmonary hypertension center of excellence for further evaluation and treatment.

## Initial Trauma Imaging

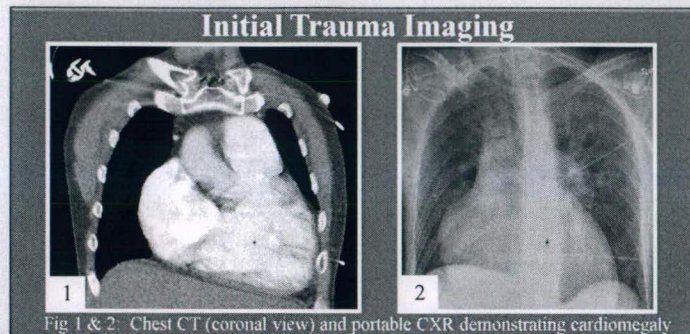


Fig 1 & 2: Chest CT (coronal view) and portable CXR demonstrating cardiomegaly

## Initial Transthoracic Echocardiographic Findings

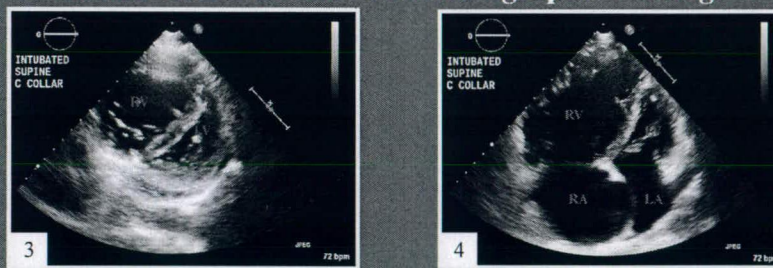


Fig 3: Parasternal short axis demonstrating enlarged RV with septal bowing

Fig 4: Apical 4-chamber view illustrating severe right ventricular enlargement

## Diagnostic Findings

Findings on TTE suggested an aorto-ventricular fistula – an uncommon cause of Eisenmenger's Syndrome. A dedicated Cardiac CT performed to evaluate additional vascular abnormalities, more clearly identified a membranous ventricular septal defect.



Fig 5: Echocardiogram demonstrating bi-directional flow across what appears to be a supravalvular aorto-ventricular fistula

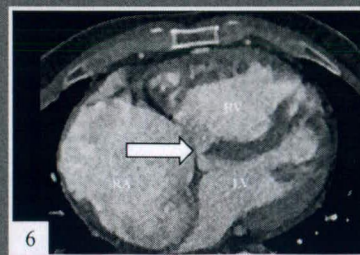


Fig 6: Cardiac CT more clearly demonstrating uncorrected membranous ventricular septal defect

## Discussion

- ES has complex hemodynamics due to pulmonary-to-systemic shunting.
- Infants with large shunts often present with heart failure when pulmonary vascular resistance falls during the first weeks of life – making it uncommon to encounter in a functioning adult patient.
- Access-to-care barriers may prevent definitive diagnosis or pediatric intervention, leading to incidental discovery in adulthood; in addition to significant morbidity and mortality in the adult patient.
- Management of ES in trauma situations is undefined – worsening shunt during positive pressure ventilation complicates the initial post-trauma management.
- Once Eisenmenger physiology is present, surgical treatment is of little benefit, but vasoactive medications may be indicated depending on underlying hemodynamics.

## Conclusions

- ES is uncommonly encountered in the adult population but can significantly impact the ability to manage patients who require cardiopulmonary support.
- Ventilation and oxygenation methods may need to be modified based on patient hemodynamics and the size of the shunt.
- Providers should be aware that they may encounter late presentations of ES, especially in those patients with poor access to care.

## References

- Heller, A. R., Litz, R. J., Koch, T. (2004). A fine balance – one-lung ventilation in a patient with Eisenmenger syndrome. *British Journal of Anesthesia*. 92 (4): 587-90.
- Joyce, J. A. (2006). Eisenmenger syndrome: An anesthetic conundrum. *American Association of Nurse Anesthetists*. 74 (3): 233-239.
- Kaemmerer, H., Mebus, S., Schulze-Neick, I., Eicken, A., Trindade, P. T., Hager, A., Oechslin, E., Niwa, K., Lang, I., Hess, J. (2010). The Adult Patient with Eisenmenger Syndrome: A Medical Update After Dana Point, Part I: Epidemiology, Clinical Aspects and Diagnostic Options. *Current Cardiology Reviews*, 6 (4): 343-355.
- Mebus, S., Schulze-Neick, I., Oechslin, E., Niwa, K., Trindade, P., Eicken, A., T., Hager, A., Lang, I., Hess, J., Kaemmerer, H. (2010). The Adult Patient with Eisenmenger Syndrome: A Medical Update After Dana Point, Part II: Medical Treatment – Study Results. *Current Cardiology Reviews*, 6 (4): 356-362.
- Mebus, S., Schulze-Neick, I., Oechslin, E., Niwa, K., Trindade, P., Eicken, A., T., Hager, A., Lang, I., Hess, J., Kaemmerer, H. (2010). The Adult Patient with Eisenmenger Syndrome: A Medical Update After Dana Point, Part III: Specific Management and Surgical Aspects. *Current Cardiology Reviews*, 6 (4): 363-372.